

## CLAIMS

1. A method for detecting outages, comprising:  
capturing error codes associated with outages in a network processing device; and  
5 automatically classifying the error codes into software caused outages and hardware  
caused outage categories.

2. The method according to claim 1 including automatically classifying at least  
some of the outages as planned operational outages and unplanned operational outages.

3. The method according to claim 2 including classifying outages as planned  
operational outages when a maintenance or planned upgrade command is detected and no  
error codes are associated with the outages.

4. The method according to claim 3 including classifying outages as software,  
hardware, and unplanned operational outages when error codes and manually initiated  
commands are associated with the outages.

5. The method according to claim 1 including:  
20 classifying the error codes as a worst case software caused outages where the error  
codes could be associated with either hardware caused outages or software caused outages;  
and

classifying the error codes as a best case software outage when the error codes could  
only be associated with software caused outages.

6. The method according to claim 1 including identifying the software caused  
outages and the hardware caused outages for multiple individual router processors in the  
network processing device.

7. The method according to claim 1 including computing an Accumulated  
Outage Time (AOT) and Number of Accumulated Failures (NAF) for the software caused  
outages and the hardware caused outages.

8. The method according to claim 2 including identifying the outages as unplanned operational outages when a manual reset command is associated with the outages.

9. The method according to claim 1 including:

5 capturing the error codes that are generated in association with the outages; and  
storing the error codes in a local persistent memory.

10. A method for measuring software outages, comprising:

10 monitoring outages in a network processing device;  
monitoring manually initiated commands to the network processing device; and  
distinguishing manually initiated operational outages from other software outages and  
hardware outages according to the monitored manually initiated commands.

11. The method according to claim 10 including:

15 capturing error codes associated with at least some of the outages;  
storing the error codes in persistent memory;  
storing the manually initiated commands in persistent memory; and  
automatically analyzing the stored error codes and manually initiated commands to  
distinguish planned operational software outages from unplanned operational outages.

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12. The method according to claim 10 including capturing information associated with a mean time between failures or a number of accumulated failures for the manually initiated operational outages, software outages, and hardware outages.

25 13. The method according to claim 10 including:

identifying the software and hardware outages associated with a first routing processor;

identifying the software and hardware outages associated with a second backup routing processor; and

30 identifying software and hardware outages associated with a network processing device containing both the first and second routing processor.

14. The method according to claim 11 including classifying the error codes that are possibly hardware caused outages as hardware outages and identifying the error codes that are possible software caused outages as software outages.

15. The method according to claim 14 including identifying the error codes that are possible hardware or software caused outages as worse case software outages and identifying the error codes that are only software caused outages as best case software outages.

16. A network processing device, comprising:  
a processor configured to capture error codes associated with network processing device outages and then automatically classify the error codes as software caused outages and hardware caused outages.

17. The network processing device according to claim 16 wherein the processor is further configured to identify operational caused outages and then distinguish planned operational caused outages from unplanned operational caused outages.

18. The network processing device according to claim 17 including a persistent memory for storing a crash file containing the error codes and Command Line Interface (CLI) commands, the processor identifying the hardware and software outages and the planned and unplanned operational caused outages according to the error codes and the CLI commands in the crash file.

19. The network processing device according to claim 18 wherein the processor is configured to identify outages that have no associated crash files as hardware outages, identify outages associated with reload or forced-switch-over CLI commands with no associated error codes as planned operational caused outages.

20. The network processing device according to claim 16 wherein the processor is further configured to classify software outages as worst case and best software caused outages according to the associated error codes.

21. The network processing device according to claim 16 including a first routing unit and a second back-up routing unit that each generate error codes individually classified by the processor as hardware caused outages and software caused outages.

5           22. A system for detecting outages, comprising:  
            means for capturing error codes associated with outages in a network processing device; and  
            means for automatically classifying the error codes into software caused outages and hardware caused outage categories.

10           23. A system according to claim 22 including means for automatically classifying at least some of the outages as planned operational outages and unplanned operational outages.

15           24. A system according to claim 23 including means for classifying outages as planned operational outages when a maintenance or planned upgrade command is detected and no error codes are associated with the outages.

20           25. A system according to claim 24 including means for classifying outages as software, hardware, and unplanned operational outages when error codes and manually initiated commands are associated with the outages.

            26. A system according to claim 22 including:  
            means for classifying the error codes as a worst case software caused outages where  
25      the error codes could be associated with either hardware caused outages or software caused outages; and  
            means for classifying the error codes as a best case software outage when the error codes could only be associated with software caused outages.

30           27. A system according to claim 22 including means for identifying the software caused outages and the hardware caused outages for multiple individual router processors in the network processing device.

28. A system according to claim 22 including means for computing an Accumulated Outage Time (AOT) and Number of Accumulated Failures (NAF) for the software caused outages and the hardware caused outages.

5 29. A system according to claim 23 including means for identifying the outages as unplanned operational outages when a manual reset command is associated with the outages.

10 30. A system according to claim 22 including:  
means for capturing the error codes that are generated in association with the outages;  
and  
means for storing the error codes in a local persistent memory.

15 31. A computer readable medium for detecting outages, comprising:  
capturing error codes associated with outages in a network processing device; and  
automatically classifying the error codes into software caused outages and hardware caused outage categories.

20 32. A computer readable medium according to claim 31 including automatically classifying at least some of the outages as planned operational outages and unplanned operational outages.

25 33. A computer readable medium according to claim 32 including classifying outages as planned operational outages when a maintenance or planned upgrade command is detected and no error codes are associated with the outages.

30 34. A computer readable medium according to claim 33 including classifying outages as software, hardware, and unplanned operational outages when error codes and manually initiated commands are associated with the outages.

35. A computer readable medium according to claim 31 including:  
classifying the error codes as a worst case software caused outages where the error codes could be associated with either hardware caused outages or software caused outages;  
and

classifying the error codes as a best case software outage when the error codes could only be associated with software caused outages.

5        36.     A computer readable medium according to claim 31 including identifying the software caused outages and the hardware caused outages for multiple individual router processors in the network processing device.

10       37.     A computer readable medium according to claim 31 including computing an Accumulated Outage Time (AOT) and Number of Accumulated Failures (NAF) for the software caused outages and the hardware caused outages.

15       38.     A computer readable medium according to claim 32 including identifying the outages as unplanned operational outages when a manual reset command is associated with the outages.

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39.     A computer readable medium according to claim 31 including:  
capturing the error codes that are generated in association with the outages; and  
storing the error codes in a local persistent memory.

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